SESSION 6

The RSA Team

In-Service (Existing Road) Audits

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PUTTING A ROAD SAFETY AUDIT TEAM TOGETHER - THE VALUE OF TEAMS,

WRITING A ROAD SAFETY AUDIT REPORT

AND

RESPONDING TO AN AUDIT REPORT

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Road Safety Audit - Putting Together an Audit Team

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THE AUSTROADS ROAD SAFETY AUDIT PROCESS

AUSTROADS defines road safety audit as "a formal examination of an existing or future road or traffic project, or any project which interacts with road users, in which an independent, qualified examiner reports on the project's accident potential and safety performance " The earlier in the design process that a road safety audit takes place the more likely it is to be able to effectively influence safety in that scheme The AUSTROADS project recognised this and developed a five stage audit process with emphasis on early intervention

Road safety audit is the examination of a road/traffic project by an independent, qualified team to ensure that the project achieves the greatest safety possible It is a straightforward process, and in simple terms allows good sound road safety engineering input into agreed stages of a road project where previously that may not have been the case

The AUSTROADS process stresses independent, qualified auditors, submitting written audit reports through a formal management arrangement The process in turn requires a written response from the project manager to the recommendations of the audit report But how does a Client know who to turn to when an audit is needed?

Should the Client go to the same consultants that they always use for other traffic projects?

Should the Client ask one of their own staff or design team to be the lead auditor?

Should the Client contact the Provincial Department of Transport and ask them to help?

To keep costs down, can a junior engineer be asked to do the audit and keep the report short?

Must an engineer be used at all?

There are many other questions that may be raised when a Client needs a road safety audit carried out - especially the first time that he/she needs an audit

To guide a Client who is in this position, the following fundamental points are recommended to be followed so that the chances of achieving a valuable, and worthwhile audit report are maximised

- Always use an audit team - never use a "one man audit team" (a possible exception may be a very minor project in a low volume and low speed environment Even then, a small team is preferred)

- Ensure that every member of the team is independent of the design and/or the project Asking anyone to audit one of their own projects is like asking a father to judge a beauty contest in which his daughter is a contestant

- Use the locally or provincially accepted criteria for registration as Senior Road Safety Auditor/Road Safety Auditor and appoint only those who meet this minimum criteria for accreditation The AUSTROADS accreditation criteria are set out below for information

- Of those potential accredited Senior Road Safety Auditors on the Provincial list select one who is experienced and knowledgeable about road safety matters for the particular stage of audit For example, if the audit is a planning stage audit, it is desirable to appoint a Senior Auditor who can demonstrate experience with planning issues and who can 'see the big picture', often from limited plans If the audit is at the detailed design stage, a different Senior Auditor may be preferred - someone with substantial design experience for instance

In either situation, always satisfy yourself that the Senior Auditor has ensured that the audit team is put together with a good blend of experiences, with varying levels of ages/empathies, hopefully a mix of the sexes, and possibly with a mixture of professions

Experiences - the lead auditor should be a very experienced professional The audit team can comprise members with varying lengths of experience This mix can be of use as new graduates may have different, but still valid, views compared with other team members with much longer work experience

Professions - invariably, an engineer will be needed for design stage audits because of the need to examine many plans This is not essential, but is the norm The rest of the team may have qualifications or experiences in fields as diverse as education, traffic enforcement, construction, maintenance, design, traffic management and accident investigation

Age - older auditors may have different life experiences which help them to anticipate safety problems with a project Younger auditors may better emphathise with the needs of less experienced drivers and road users

Empathies - some people are more atuned to the safety needs of vulnerable road users, while others tend to concentrate on the safety needs only of those in motorised transport A mix of the two is desirable

Sexes - an audit team should ideally have a mixture of the sexes Women have certain abilities which can be of enormous assistance to an audit team - apart from many of them being fine designers and engineers, many also have a feel for the safety needs of the road user This is a vitally important skill to bring to a road safety audit team

ISSUES TO BE RESOLVED IN PUTTING TOGETHER AN AUDIT TEAM

- **There is a need for a nationally/regionally accepted system of accreditation for road safety auditors.**

The traditional system by which a client selects a road safety auditor is prone to two main problems Firstly, the client may not be able to find a complete listing of all potential auditors This will restrict their access to the widest range of auditors from which to choose Secondly, when selecting an auditor, how can the client be sure that the auditor is "qualified" and is the best one for the task?

The answer to these concerns is a nationally accepted accreditation system for auditors which can be readily accessed by clients AUSTROADS has formulated the following model for accreditation and it has become widely accepted around Australia in the past year

A	Five years (minimum) relevant experience in road design traffic engineering road safety engineering or other closely related road safety discipline
B	Successful completion of a road safety audit training course, approved and recognised by a State Road Authority
C	Participation in at least five road safety audits under the guidance /leadership of a Senior Auditor of which at least three must be design stage audits and another must be a Stage 4 or 5 audit
D	Certify maintenance of knowledge and experience by participating in at least one audit per annum

To be listed as a Road Safety Auditor, a person is required to satisfy points A and B above To be listed as a Senior Road Safety Auditor, a person is required to satisfy points A, B, and C above Both levels of auditor will be required to satisfy point D in order to remain on the list of accredited auditors

- **Avoid one man audit "teams"**

AUSTROADS strongly supports teams of between two four auditors with differing experiences Those who have participated in audit teams know the value which was added to an audit through the inputs of additional experienced road safety professionals - Police, road safety officers, design engineers, construction engineers etc Try to avoid the use of one man audit "teams" unless absolutely necessary

- **Some see road safety audit as a compliance check to ensure that standards are met**

An experienced road safety auditor knows that it is much more than that! A road safety audit should never be seen solely as a check to ensure that all current standards are satisfied Indeed if a person suggests that this is the main aim of a road safety audit, the Client would be well advised to look elsewhere for an auditor

To explain this further, consider an example of a detailed design stage audit of a rural re-alignment (re-aligning a road to line up with the approaches to a new bridge over a local stream) - it should ensure, amongst other things, that minimum horizontal and vertical alignments are achieved It should also seriously question whether those standards are adequate for the project, and whether or not they need to be raised (for instance, is the area prone to fog?)

But most importantly, the auditor must put him/herself in the shoes of the road user and ask the important question "What will the road user make of this design?"

Lets imagine this sample section of rural road is straight, following a line of power poles for five kilometres before curving to the left The line of power poles keeps straight, following the alignment of the "old road" What would any motorist, under any weather condition, under any light condition and under any physical condition (maybe the influence of alcohol) make of the visual message given by the power lines? From a distance, does the road go straight on, or does it curve? The road safety audit would bring this concern to the attention of the project manager, although there is no such thing as a standard for the "visual influence of poles next to roads" The audit report may recommend additional delineation (above and beyond the minimum specified in a standard) at the end of the straight to override the visual deceit created by the line of poles Clearly, a road safety audit is more than compliance with standards

- **Training in the audit process is vital if safety audit is to retain credibility as a powerful road safety process**

Training of road safety auditors should ideally be co-ordinated at the national level Training should have a national or regional focus, and it will be needed for many years into the future - Australian experience is finding that more people are being trained now than when the first round of training commenced five years ago This is possibly a reflection of the lead time that a new process takes to filter through the various levels of government and into all the outlying areas of Provincial and local governments, not to mention consultants There are three groups in need of specific road safety audit training

- those who need awareness of the process (such as road safety professionals and senior managers)
- those who are to do the audits, and
- those who are to use and respond to the audit outcomes (typically project managers)

AUSTROADS has minimum requirements for an approved road safety audit course, which includes presentation sessions on

- what road safety audit is and why it is needed,
- how road safety audit is applied,
- how road safety audit is managed,
- how to present an audit report, and how to respond to an audit report
- at least one "real-life" case study, preferably a design stage audit

There are about 8-10 AUSTROADS approved training workshops per year in Australia, training between 200 and 300 people each year

- **Do not accept the lowest quote without assessing the skills/expertise of the auditor.**

Australian experience with audit costs is indicating that a design stage audit of a large scheme may cost some $3,500 per stage, and a small scheme may cost up to $1,000 per stage Many consultants are keen to establish themselves as experienced auditors in what is seen as a growth area, and at present a wide variety of tender prices are often received in response to an advertisement for an audit The "market place" is establishing the "going rate" for audits, but there is a very real concern that the continued lack of any form of accreditation for auditors is allowing underpriced and under skilled people into a field where skill and judgement is paramount

CONCLUSION

Road safety audit provides the means to focus on the safety principles and practices of road network delivery and to correct deficiencies before road users are exposed to them The AUSTROADS national guidelines are giving road safety audit the focus and the promotion it deserves

In particular, a system of auditor accreditation is currently receiving national adoption An agreed outline for an approved road safety audit training course has been reached, and this has stimulated quality training in this important road safety field

At the end of the day, the quality of a road safety audit report depends on the experience, skill and judgement of the individuals in the audit team The single most important thing that the Client can do is to carefully select a Senior Road Safety Auditor and an audit team which is the most experienced and offers the level of expertise commensurate with the project

WRITING A ROAD SAFETY AUDIT REPORT AND RESPONDING TO AUDIT RECOMMENDATIONS

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A road safety audit is a formal process - more than an informal check The outcome of an audit is a written report which contains a list of concerns about road safety matters, and recommendations on how these identified potential safety problems in the road's design may be addressed The road safety audit process requires that these recommendations be formally responded to by a person responsible for the project. That is, they are to be given due consideration by the client or designer/project manager, and weighed up with many other project objectives The written response may become a public document at some later stage - particularly in the event of a road accident on the new section of road The project manager needs to be aware of this and to be cognisant of his/her responsibilities to not only complete the project on time and on budget, but also to produce a "safe" road.

WRITING AN AUDIT REPORT

The main task of the road safety audit report is to succinctly report on aspects of the project which involve unnecessary, or unreasonable hazards and to make recommendations (where possible) about corrective actions The report should usually contain

- a brief description of the project and its background,
- a list of the background information provided to the audit team during the commencement meeting,
- a list of the members of the audit team,
- a record of when the audit was carried out, including site inspections,
- a logically arranged list of potential safety problems identified by the audit team, including a brief explanation of each safety concern,
- a clear indication of those safety concerns which the audit team believes are of such a high risk that they must be given added priority in assessment by the Project Manager. These for instance may be labelled IMPORTANT, or FOR IMMEDIATE ATTENTION
- photographs of relevant safety concerns should be included in the report if possible These are not only useful during the completion meeting but are also useful during later stages of audit as an historical document of the project

The safety concerns and the attendant recommendations should be listed in the road safety audit report in an order which is logical for those considering the corrective actions This can be done either under subject headings (e.g in the order given in the checklist) or, where a length of road is involved, by dealing with items sequentially along the road. With this latter approach any possible interaction between the problems at each site is more likely to be recognised and addressed effectively On projects involving considerable lenghts of road it may be more appropriate to split the project into sections

Any safety issue which is considered to be of sufficient hazard to warrant immediate attention for removal, protection or warning should be identified in the recommendations with the words "FOR IMMEDIATE ATTENTION". Similarly, any problem which the audit team considers worthy of the most effort to resolve, as the potential danger is the greatest, can be identified as "IMPORTANT" These two categories are not mutually exclusive Their use does not infer that other identified problems are not important

In line with the need to maintain good communication with the designer, the audit team should endeavour to resolve any uncertainties or misunderstandings before drawing conclusions But the audit team has a position of independence and should not, for example, provide a draft of the road safety audit report to the client or designer for comment. The audit report should be tabled at the exit meeting, and while it may be solidly discussed it should not be the subject of redrafting

In summary, the road safety audit report should be a concise and succinct document which
sets out a brief summary of previous events and identifies any measures that should be considered for corrective action It does not need to be lengthy, nor does it necessarily need to comment on any positive safety aspects of the scheme

RESPONDING TO AUDIT RECOMENDATIONS

The road safety audit report will identify safety problems and will contain recommendations to improve the safety of the project Following receipt of the report, the client or the project manager should assess the report and provide a written response, detailing the follow-up action which is to take place as a consequence of each recommendation in the audit team's report

Each recommendation in the road safety audit report can be acted upon by either

1. accepting it and designing a solution to overcome or reduce the problem, in line with the audit recommendation Each of these agreed actions should be documented
2 rejecting the recommendation In this case the reasons must be set out in writing by the project manager As said earlier, this response to the audit

report may become a public document at some later time, and the project manager is advised to be aware of this

For any project, documented decisions regarding the agreed actions on all the audit report recommendations should be signed by someone in a recognised position of authority (for instance the client, municipal engineer, the regional manager or - in the case of a major, independently managed road project- the project manager.) The person preparing this response report may not feel confident to adequately address each safety item contained in the audit report If so, assistance should be sought from an independant road safety engineer (not a member of the audit team) who may be better able to give skilled technical advice to assist the project manager and the project team

A systematic procedure is required for dealing with audit recommendations Once several projects are being audited at different stages it can become impossible to keep track of where each audit and its response is at any particular time Good systems and good documentation are essential It has been the experience in Victoria during the first years of road safety audit that many project manager and designers did not know how to respond to audit recommendations Should all the recommendations be accepted? Should they all be ignored? Why is this audit team attacking "my" project? Don't they know that we have a deadline to meet - and who invited them here anyway?

Fortunately, this initial reaction has slowly been overcome, and most project man\agers now realise that road safety aduit is a positive process which exists to assist a project They welcome a positive and constructive input from the audit team.Training workshops such as this one have directed attention not only at future audit team members but also at existing or future project managers - those who need to know the road safety aduit process and its value to all road users

In responding to audit recommendations, it is important that the consequences of action or inaction are properly understood and that all the factors in the road safety audit report are considered The concept of risk is one which may be used to prioritise the countermeasures to be adopted as a result of an audit

RISK = ACCIDENT FREQ. X SEVERITY

where accident frequency is Probability x Exposure

It is expected that as audit teams and project managers become more accustomed to the audit process,most audit recommendations will be accepted and acted upon. This will require good understanding of the audit process by clients, designers and project managers

RESPONDING TO AN AUDIT REPORT

- NOT EVERYONE AT THIS WORKSHOP WILL GO ON TO BE A MEMBER OF A ROAD SAFETY AUDIT TEAM.

- SOME WILL BE THE EXECUTIVE RESPONSIBLE FOR INTRODUCING ROAD SAFETY AUDIT INTO THEIR ROAD AUTHORITY.

- SOME WILL BE THE PROJECT MANAGER OF A PROJECT WHICH IS AUDITED.

- IF YOU ARE THE RECIPIENT OF AN AUDIT REPORT REMEMBER:

  - THE AUDIT HAS BEEN DONE TO HELP YOUR PROJECT

  - THE AUDIT IS A POSITIVE CONTRIBUTOR TO THE SAFETY OF YOUR PROJECT.

  - IT IS STILL YOUR PROJECT, AND YOU ARE RESPONSIBLE FOR THE JUDGEMENT OF WHAT WILL/ WILL NOT HAPPEN.

  - CHAIR THE EXIT MEETING, AND MAINTAIN PROFESSIONAL STANDARDS

  - YOU ARE REQUIRED TO RESPOND IN WRITING TO THE AUDIT REPORT (A POSSIBLE PUBLIC DOCUMENT).

  - JUSTIFY YOUR DECISIONS - A LACK OF MONEY CAN BE A VALID REASON IF PROPERLY DOCUMENTED. A SIMPLE "DO NOT AGREE" COULD BE HIGHLY CONTENTIOUS IN A LATER COURT CASE.

NOTE: IF NOT SURE, ENGAGE AN INDEPENDENT CONSULTANT TO ADVISE YOU.

WRITING A ROAD SAFETY AUDIT REPORT

- *RESPONSIBILITY OF THE SENIOR ROAD SAFETY AUDITOR*
- ACCURATE DESCRIPTION OF THE PROJECT SITE AND THE STAGE OF THE AUDIT
- BRIEF DESCRIPTION OF THE PROJECT AND BACKGROUND
- LIST OF INFORMATION PROVIDED
- LIST OF AUDIT TEAM MEMBERS
- DATES AUDIT WAS CARRIED OUT, INCLUDING SITE VISITS
- LOGICALLY ARRANGED LIST OF POTENTIAL SAFETY PROBLEMS
- CLEAR INDICATION OF THE MORE IMPORTANT SAFETY CONCERNS
- PHOTOGRAPHS OF KEY ISSUES
- SIGNED AND DATED STATEMENT BY THE AUDIT TEAM

EXAMPLE OF AN UNACCEPTABLE RESPONSE TO A ROAD SAFETY AUDIT REPORT FOR A RECENTLY COMPLETED SECTION OF RURAL HIGHWAY

- *A number of culverts and batters did not have the appropriate guardrail protection. Existing guardrail did not have the appropriate flares.*

Response - all guardrails have bullnose ends. In relation to other guardrail needs in this area, this is not considered a priority. No action is planned to install correct parabolic flares.

- *Fixed objects were located within the clear zones, including a concrete bus shelter, stock piles and box culverts.*

Response - the bus shelter is 4m from the edge line; the expense in moving it is not considered justified. Most of this Highway has fixed objects within the clear zone - there are more than 150 trees within a few metres of the road in the section 3 km south of here.

Some of the stockpiles are near the road. There are limited places to stockpile near here and it is considered uneconomical to discontinue using the site. No action is planned to relocate the stockpiled material.

It is proposed to remove the small box culverts - they can be used for other drainage works, due to be completed this financial year

A PREFERRED RESPONSE

- *A number of culverts and batters did not have the appropriate guardrail protection Existing guardrail did not have the appropriate flares*

A detailed inspection of the roadside hazard protection for this site will be commissioned as part of next years program. Any necessary remedial works will be prioritised by the consultant, with urgent works being scheduled within that years program and less urgent being scheduled as soon as resources permit.

- *Fixed objects were located within the clear zones, including a concrete bus shelter, stock piles and box culverts.*

The bus shelter has been there for many years, but with the road widening it is a fixed object now located within the currently agreed clear zone distance. It will be relocated to a suitable location outside the clear zone in consultation with the families of the children who use the shelter.
The stock piles are an important part of our authority's maintenance progam along this highway. However, I have asked the Superintendent of the maintenance program to examine alternative sites and to report back to me in writing by the end of the month. These stock piles will be used up within a few months, and I will direct that any new material is deposited at the agreed new site.

The box culverts will be used in the near future for drainage works. The first row of culverts closest to the road will be relocated to their final destination by the contractor within a week. The remaining culverts are located towards the outside of the clear zone, on a straight section of road with a newly paved surface. A warning sign and three delineators will be installed as an interim measure for added protection.

Conducting A Road Safety Audit

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There are 8 main steps in conducting a road safety audit Each of these are outlined in the following paper National/Provincial policies, or the Client's requirements, will direct Project Managers in the use of road safety audits Once it is established that a project is to be road safety audited, the following steps need to be undertaken

1. APPOINTMENT OF THE ROAD SAFETY AUDIT TEAM

The Project Manager, unless otherwise directed by the Client, is responsible for the appointment of an audit team The team is to be fully independent of the design and the project, it should be led by a registered Senior Road Safety Auditor, and it should have team members with a wide range of road safety skills and experiences A typical audit team for an audit of a large project may comprise between 2 and 4 people, with sometimes an extra expert for specific issues More details on selecting a road safety team are contained in the paper on this topic elsewhere in these Workshop notes

2. PROVIDING ALL THE NECESSARY BACKGROUND INFORMATION

The Project Manager is required to provide the audit team with a comprehensive set of drawings, reports and associated background information so that a full understanding of the project, its key objectives and any associated issues can be gained Information provided will typically include

- project intent - the purpose of the project, how it will be achieved, any design compromises and community inputs
- site data - including traffic data, known safety issues which remain unresolved from earlier audits, the design standards used, and site constraints (such as historic buildings, underground services, weather, trees etc)
- plans and drawings - a full set of the plans and drawings relevant to the stage of audit, together with any plans which may affect adjacent roads

3. HOLD A COMMENCEMENT MEETING

The background information is handed over to the Road Safety Audit team during a Commencement Meeting This meeting is arranged by the Project Manager, and is usually held in the Project offices The objective of the meeting is to acquaint the road safety audit team with the background to the project as well as to familiarise the Project team with the audit process
During the meeting, the audit team is briefed on the scope of the project, the timetable for the completion of their report and any other relevant matters The meeting provides the opportunity for the audit team to ask questions about the project and to establish the relevant contact in the project office for further queries It is important that the project team and the audit team both understand that communication during the audit is necessary and is generally positive The audit team must be aware however that it should not leave a safety concern unreported simply on the verbal advice of a project officer
The commencement meeting is intended to

- introduce the audit team to the Project Manager
- clarify any uncertainties either party may have about the road safety audit process
- make arrangements for the site inspections to take place (safety for the audit team must not be overlooked)
- provide an opportunity for the handover of the plans and other background information
- reach agreement on a timetable for the audit

4. CARRY OUT THE AUDIT - DESKTOP AND ON-SITE

The Road Safety Audit team then carries out the audit - generally starting with a desktop evaluation of all of the material provided by the Project Manager The desktop audit and the site inspections usually take place in parallel This step is important, and the technical skills and experiences of the audit team are put to use in auditing the potential safety problems in the proposal

The audit team must remain focussed on safety issues only, and must not digress into other matters such as costs, alternative treatments, other possible design options or other project related matters

After the desktop audit, the audit team must inspect the site - preferably during both daytime and nighttime The site inspection is essential in order that the team can gain a complete picture of the environment in which the project is located It allows the road safety audit team to see how the proposal interacts with its surroundings and the nearby roads, including the sections of existing road immediately either side of the site The team gains the opportunity to visualise potential conflicts for road users and to anticipate any potentially misleading features at this time

The audit team is expected to put itself into the shoes of the road user and to drive, walk and even bicycle the area in order that potential safety concerns can be identified A set of checklists is a valuable tool for the audit team to use during the desktop audit as well as the site inspections If necessary, and especially for larger projects, the audit team may need to return to the site a number of times and to repeat the desktop audit several times until the Senior Auditor is satisfied that all safety issues have been addressed

5. WRITE THE AUDIT REPORT

The main task of the audit report is to accurately yet succinctly report on the safety concerns of the project The Senior Road Safety Auditor is responsible for the preparation of a formal report which includes the following information

- a brief description of the project and its background
- a list of the background information provided to the audit team during the commencement meeting
- a list of the members of the audit team
- a record of when the audit was carried out, detailing times and dates of site visits
- a logically arranged list of potential safety problems identified by the audit team, including a brief explanation of each safety concern
- a clear indication of those safety concerns which the audit team believes are of such a high risk that they must be given added priority in assessment by the Project Manager These for instance may be labelled URGENT, IMPORTANT, or SIGNIFICANT
- photographs of relevant safety concerns should be included in the report if possible These are not only useful during the completion meeting but are also useful during later stages of audit as an historical document of the project
- a signed and dated statement by the audit team that they have completed the audit

The audit report is not expected to contain a list of detailed recommended countermeasures (unless this is a specific requirement from the Client/Project Manager and is understood during the commencement meeting) Any recommendations will usually indicate only the nature or direction of a solution rather than details of how to solve the problem However, if the safety concern has a single, simple countermeasure the report may mention it For example, if the audit team has concerns for the safety of high speed traffic approaching a curve it may report on this and recommend increased delineation on the approaches to and through the curve It does not need to detail each and every standard warning sign to use

The audit report is an "exception" report and is not expected to report on "good safety points" about the project, although a general comment about the level of attention to safety may be diplomatic on occasions

6. HOLD A COMPLETION MEETING

The Completion meeting is held at a mutually convenient time and should involve the full audit team, the Client, the Project Manager and those in the Project office who will be required to respond to the audit report It provides an opportunity to discuss the recommendations for corrective action During this meeting, the Project Manager receives the audit report, asks questions of clarification of the audit team's findings and agrees on a timetable for the completion of a response report The Senior Road Safety Auditor outlines the key findings of the audit, and answers any questions the Project Manager or his/her team may ask

The meeting should be run so that the independence of the audit team is not affected The meeting is not an opportunity to disagree with the audit report findings and recommendations, but is an opportunity for mutual constructive discussion

Based on experiences in places where the road safety audit process is still new, this is the most sensitive step in the audit process Diplomacy and understanding are required by both sides in this meeting The Senior Road Safety Auditor must exercise the professional diplomacy which is an essential ingredient in the successful completion of a road safety audit The Project Manager

too is expected to receive the report as a positive aid to the project and must not take its contents as a criticism of the project or of him/her This highlights the need for Project Managers to be trained in the road safety audit process so that they know the process well and see that it is a positive benefit for their work - not an attack on it

7. WRITE A PROJECT MANAGER'S RESPONSE REPORT

This step is to judge whether the findings and recommendations of the road safety audit report should be implemented and, where it is decided otherwise, to give written reasons for the decision If necessary, the Project Manager (or the Client if applicable) may wish to call on the expert technical assistance of an independent road safety engineer who can provide details on how to respond to each audit finding

This step is the most overlooked step in the process It is also one of the most important because completion of this step affords the best documented defence against any possible future legal liability cases involving accidents on the new project

The Project Manager is required to respond to each individual safety concern with a statement on whether the safety concern is acknowledged or not and what action if any is to take place
This response report is a public document and as such could be used in a court of law at a future date The Project Manager needs to be aware of this and to give the appropriate consideration not only to the technical matters of the countermeasures to be undertaken, but also the sensitivity involved in explaining why some actions may not take place

8. ENSURE THAT THE SAFETY CONCERNS ARE FOLLOWED THROUGH

The Project Manager and the project team are responsible for the delivery of the finished project to the Client The Road Safety Audit team is one specialist group which can assist the Project team in delivering a safe project The Project Manager must follow through from the response report and ensure that the necessary changes are made to the project to accurately reflect the agreed improvements detailed in the audit report Independent technical experts may be called in to assist with this step

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PREVENTION IS BETTER THAN CURE - THE ROAD SAFETY AUDIT PROCESS

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1. INTRODUCTION

A major emphasis in road safety engineering in Australia and elsewhere for a number of years has been on accident *reduction* (the development of accident remedial measures for high accident frequency sites) Most state road authorities have active "blackspot" programs in which millions of dollars are spent each year alleviating problem sites, and the Federal Government recently recommenced the Federal Blackspot program which will invest almost $150 million in 4 years State road authorities have also been focusing on accident *prevention* (ensuring that the design of new road and traffic schemes will provide a high level of safety), attempting to prevent accidents from happening, or at least to ensure that any accident effects are minimised The AUSTROADS Road Safety Audit book, released in 1994, provides a focus for work in this important safety field Whilst accident *reduction* work continues to be a major component in each state road authority's annual program, accident *prevention* - via *road safety audit* - has become, or is now becoming, established throughout Australia, New Zealand, Great Britain, Canada, Singapore, Malaysia, South Africa, the United States and several other countries

So ***what is*** road safety audit? ***When***, ***how***, and ***where do*** we audit? And ***why*** do we even need it? This paper aims to answer these questions, and in so doing encourage participants at this Workshop and their highway authorities to embrace road safety audit within their road design processes The paper draws on experience with road safety audit in the United Kingdom, New Zealand, Australian states and more recently South Africa It is based largely on the two papers by Jordan and Barton (1992), and by Jordan (1993) and includes some outcomes of the National Road Safety Audit Summit held in Adelaide in 1997

2. WHAT IS ROAD SAFETY AUDIT?

Most road safety engineers have suffered the frustration of investigating accident problem sites on *new* sections of road Their first response is always the same - why was it ever built like this? In some cases practical constraints at the planning and design stages of the scheme contributed

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to the safety problems of the site In many of the cases though, the 'blackspot' is the end result of a failure on the part of the designers to recognise the full safety implications of their work In such cases, road safety audit has a vital role to play to ensure that future new road schemes provide a high level of safety by identifying potential safety problems before they are built

AUSTROADS (1994) defines road safety audit as "a formal examination of an existing or future road or traffic project, or any project which interacts with road users, in which an independent, qualified examiner reports on the project's accident potential and safety performance."

Safety audit can also be defined as "the evaluation of physical elements and their interaction having a direct bearing on the safety of road users and others affected by a road construction scheme in order to detect foreseeable potential safety hazards before a new road is opened to traffic." (DTp 1990). Alternatively, "safety audit is the application of safety principles in the provision, improvement and maintenance of roads as a means of accident prevention." (IHT 1990).

Clearly, the main objective of road safety audit is to ensure a high level of safety for all new highway schemes from day one, this means that safety is given thorough consideration throughout each design and construction phase of the project But there are other secondary objectives too, (IHT 1990) including

- to reduce the whole-life costs of a scheme (unsatisfactory designs can be expensive to correct *after* they are built)
- to minimise the risk of accidents on the adjacent road network, (particularly at tie-ins) as well as on the new road scheme
- to enhance the relevance of road safety engineering in highway design work
- to enhance consideration of the safety of *all* road users in *all* new and existing schemes

Belcher and Proctor (1990) explain that safety audit works in two ways to ensure that safety is improved, namely by removing preventable accident producing elements (such as inappropriate intersection layouts) at the design stages, and by mitigating the effects of remaining problems by the inclusion of suitable accident-reducing elements(such as anti-skid surfacing and crash barriers) Road safety audit is not a 'check' but is more a vigorous and structured process that requires a detailed examination of a road scheme, a written report from the auditor, and a subsequent response by the project manager stating why recommended actions have/have not been adopted A safety audit process is very much a logical inclusion in the quality management process, and in Britain the drive towards quality assurance was the key factor in the rapid adoption of safety audit by highway authorities With the general intention to "get it right the first time" the road safety audit process is now included as a quality management process of state road authorities in Australia and New Zealand

3. WHEN DO WE CARRY OUT A ROAD SAFETY AUDIT?

It is up to each highway authority to determine when road safety audit will/should be introduced into their design process There are five recognised stages at which a road safety audit can be conducted - feasibility stage, draft design stage, detailed design stage, pre-opening stage and an existing road audit The earlier that a project is audited in the design process the better Early auditing can achieve better results at much lower remedial cost

Feasibility (Planning) Stage

By providing a specific safety input at the feasibility stage of a road scheme, road safety audit can influence fundamental issues such as route choice, standards, impact on and continuity with the existing adjacent network, and intersection or interchange provision For traffic management schemes or other small improvements this stage may be less significant, but can still offer useful safety benefits

Layout Design Stage

On completion of the preliminary road design, typical considerations include horizontal and vertical alignments, and intersection layouts After this stage, as land acquisition and other associated legal matters become finalised, subsequent changes in road alignment become much harder to achieve

Detailed Design Stage

This audit stage occurs on completion of the detailed road design but before the preparation of contract documents Typical considerations include geometric layout, linemarkings, signals lighting, signing, intersection details, clearances to roadside objects (crash barriers/frangibility) and provision for vulnerable road users Attention to detail at this design stage can do much to reduce the costs and disturbance associated with last minute changes which may otherwise be brought about with a Stage 4 (pre-opening) audit

Pre-Opening Stage

This audit involves a detailed inspection of a new scheme prior to its opening The new road is driven, ridden and walked (when appropriate) by the auditor (or audit team) to ensure that the safety needs of *all* road users are provided for A night time inspection is particularly important to check signing, delineation, lighting and other darkness-related issues

Audit of Existing Roads

This audit aims to ensure that the safety features of a road are compatible with the functional classification of the road, and to identify any feature which may develop over time into a safety concern (eg foliage blocking sight distance) Audits of existing roads have been undertaken in most States, and enthusiasm for auditing the existing network in various States is high However, road safety audit will be more effective if carried out early in the design process Highway authorities are therefore urged to maintain a focus on audits at the design stages

4. HOW DO WE CARRY OUT AN AUDIT ?

The safety auditor (or more desirably the safety audit team) is responsible for checking the *safety elements* at each stage of a scheme against an agreed checklist to identify any safety faults, defects, or omissions It is not the auditor's role to redesign the scheme, nor to implement changes The safety auditor is responsible for reporting and recommending on safety related matters to the project manager, or other person nominated by the client

An auditor (or audit team) will ideally have a sound knowledge of safety principles and design standards Many will have had substantial experience in road safety engineering, such as investigating high accident frequency sites, in addition to traffic engineering/civil engineering backgrounds Their task is assisted by the use of checklists, and many checklists have been developed for this purpose The AUSTROADS Road Safety Audit book (1994) contains a national set of road safety audit checklists which have become the benchmark for use in Australia and New Zealand

Whilst some debate takes place on the value of a detailed checklist, it should be noted that many auditors, especially soon after the introduction of a road safety audit process in a highway authority, may be inexperienced and will welcome a checklist as a prompt The checklists should also be available to the highway designers so that they have a ready understanding of safety principles in the design process Experience suggests that designers who are aware of the audit checklists and the safety audit process invariably develop designs which contain fewer safety concerns

4.1 Organisational considerations

There are a number of ways that a road safety audit process can be organised within a highway authority - resources will generally dictate which way is chosen The six organisational arrangements which are commonly mentioned (AUSTROADS 1994) are

Specialist Audit Team

A specialist team audits each design and is responsible for formal approval (i e issue of a safety certificate) before the scheme can advance to the next stage This system is demanding on manpower resources and, because of its approval role, the audit team must be suitably experienced and have the full support of senior management Only the Director of the Department can override the team's recommendations The County of Kent in Great Britain, one of the pioneers in road safety audit, uses this organisational arrangement

Specialist Advice, reporting to an Independent Project Manager

A specialist safety team prepares an audit report and submits this to a third party (usually an independent senior manager) who decides on the action to take and directs the design team if changes are needed This arrangement is often used in Britain, particularly when consultants design a major new road scheme for a client group within a county which in turn asks the county's specialist safety team to act as auditor This is also the most common system in use

in Australia at present, where consultant audit teams report directly to a project manager on the safety issues of a design

Specialist Advice, reporting to the Designer

A specialist safety auditor, (or team) prepares a report and submits this to the original designer who determines what action to take The reasons for accepting/rejecting any of the audit report recommendations must be documented by the designer, who remains accountable for the decisions, and this document is sent to the safety team as feedback

Audit by Second Design Team, reporting to an Independent Assessor

Resource constraints may make it impossible to have a specialist safety team in an organisation If that is the case, a second design team can audit the first design team's work and pass its audit report to an independent assessor who decides on the actions to take and who also documents these decisions in a written report

Second Design Team Auditing

The second design team audits the first design team's work, and reports back to the first team which then decides, in a written report, whether to accept or reject each part of the audit advice Oxfordshire County Council in Britain, being a relatively small county with limited specialist resources, adopted a version of this arrangement when it introduced road safety audit into its design process (Oxfordshire 1991)

Own Team Auditing

An individual within the design team acts as auditor, and an audit report is prepared and documented It may be difficult to achieve independence on the part of the auditor in such arrangements, but this arrangement is generally considered to be better than no road safety audit at all

4.2 Experienced, independent audit teams

Perhaps the most important single aspect of a successful road safety audit is the selection of a suitable, independent, experienced road safety audit team It is desirable that a team of two-four auditors be used, depending on the size of the job, as the variety of experience contained within a team will give a more complete picture of the safety issues involved It is essential that each member of the audit team be experienced in an area of road safety and be totally independent from the design It has been said that by having an auditor who has been a part of the design team is like asking a father to judge a beauty contest in which his daughter is a contestant!

The present system by which a client selects a road safety auditor is prone to two main problems Firstly, the client may not be able to find a complete listing of all potential auditors This will restrict their access to the widest range of auditors from which to choose Secondly, when selecting an auditor, how can the client be sure that the auditor is "qualified" and is the best one

for the task? The answer to these concerns is a national accreditation system for auditors which can be readily accessed by clients

The Adelaide Road Safety Audit Summit in May 1997 was held partly in response to continued calls for a nationally accepted accreditation scheme for auditors It lead to the formulation of the following model for accreditation

a Five years (minimum) relevant experience in road design, traffic engineering, road safety engineering or other closely related road safety discipline
b Successful completion of a road safety audit training course, approved and recognised by a State Road Authority
c Participation in at least five road safety audits under the leadership of a Senior Auditor
d Certify maintenance of knowledge and experience by participating in at least one audit per annum

This recommendation from the Summit has been adopted by most if not all states To be listed as a Road Safety Auditor, a person is required to satisfy points a and b above To be listed as a Senior Road Safety Auditor, a person is required to satisfy points a, b, and c above Both levels of auditor will be required to satisfy point d in order to remain on the list of accredited auditors

The best and most efficient management arrangement for the maintenance and updating of the accreditation database was discussed but not resolved at the Summit It is most likely that the management arrangement will vary from state to state, using resources of either the state road authority or a key professional association

4.3 Costs

One of the major concerns of managers and engineers, whenever the question of road safety audits arises, is one of resources There is a perception that a road safety audit

will be costly in itself, will lead to "extras" in the design which will add substantially to the project cost, and will add time to the overall design/approval process

Experience to date is helping to allay these concerns Design stage audits are typically costing between $2,000-$3,000 each for major new schemes (in the order of 1% of total design costs) and many of the safety concerns picked up in these audits involve minor, rather than major, works Design schedules are beginning to allocate time for safety auditing, with the result that audits are being carried out at convenient times and are not wasting overall design or approval time

4.4 Benefits achieved

The direct and indirect benefits of road safety audit have not yet been evaluated There can be no doubt that such an evaluation will be difficult, but without it the advancement of road safety audit is being slowed The audit process needs to compete for scarce financial resources against programs such as accident blackspot programs which have been shown to produce benefits of 400% (Corben et al 1996)

However, the benefits of road safety audits range from specific benefits at a site through to broader benefits covering the wider issues of road safety engineering We can speculate on the site specific benefits of safety audit (Ogden and Jordan 1993) such as

- some existing design and construction practices allow deficient road projects - a formal audit is likely to improve this
- the community benefits of preventing even one casualty accident at a site will far outweigh the cost of a full audit
- the resources necessary for an audit are in fact quite small, and over the whole life of a scheme the costs of the audit will be more than recouped from savings, including accident savings and road furniture maintenance savings

Benefits of road safety audit, particularly when supported as a uniform national process, include

- reduced whole of life costs of road schemes
- providing a component of accident reduction targets
- fostering the importance of road safety engineering
- explicit consideration of the safety needs of *all* road users
- on-going improvements to safety standards and procedures

While it is too early to quantify the direct benefits of road safety audit, AUSTROADS (1994) has estimated that a 1% to 3% casualty accident saving (worth up to $275 million per year) is possible across Australia when audit is fully operational

Highway authorities have shown that, by adopting road safety audit, they believe it will yield positive economic returns for their communities In addition, road safety engineering is now receiving explicit consideration in all road and traffic management design matters

5. WHERE DO WE AUDIT ?

The client will normally direct which schemes are to be audited, and by whom and at which stage(s) Ideally, every new scheme should be audited at each of the design stages, but in the real world resources may not permit this Various authorities are tackling this issue in different ways

- the British Department of Transport requires a road safety audit at the (AUSTROADS) stages 2, 3 and 4 of all works on motorways and trunk roads
- VIC ROADS requires all schemes in excess of an estimated $5 million to be audited at each design stage, and 20% of smaller jobs audited at appropriate stages
- The RTA - NSW has a similar policy and, in addition, audits 20% of the existing State Highway network annually

The best balance of cost of scheme, classification of road, percentage of total jobs, available resources and so on will never be a simple one to decide upon However, on the basis that there is a clear expectation that road authorities will design and build safe roads which satisfy quality assurance criteria, every road authority should plan to introduce safety auditing into its design processes to the limit imposed by manpower and financial constraints

6. WHY DO WE NEED ROAD SAFETY AUDIT?

Road and traffic engineers have always been concerned for safety, and have always designed with safety in mind However, many new road projects have been opened which have immediately become accident blackspots Looking at *how and why* such sites slip through the traditional system of engineering design and checking yields a very positive answer to the question of why we need road safety audit

- Sometimes a design may include standards which are inappropriate for the type of road
- In some cases, outdated standards may be used in a design
- Sometimes the combination of various elements of the design may yield a result which is not the best in terms of safety
- Often, compromises between capacity and safety are made which lead to a degradation of safety
- Sometimes changes are made during construction which do not fully consider operational safety factors

Road safety audit will not necessarily make every new design totally "safe" but it does raise safety high on the decision making agenda and it does cause deliberate decisions to be made on the basis of carefully considered safety advice The earlier in the design that the audit is carried out, the easier and cheaper it is to achieve change

Formalised safety audit processes have been introduced in all Australian States, Britain and New Zealand, Singapore and Malaysia, and are in the process of being introduced into Canada and the United States, as well as several western European nations and South Africa To show justification for it, the histories of four sites on relatively new sections of road in different parts of the world are given below Each site went through the traditional design/checking process - that is, none of them were subject to a road safety audit at an early design stage - although three of the case studies were subject to a pre-opening (stage 4) road safety audit Three of the projects were multi-million dollar schemes, and each has become well known to many road safety engineers Their histories can provide a useful educational role

Site 1 - A pre-opening (Stage 4) audit of a new inner relief road in the town of Banbury, Oxfordshire

The first road safety audit carried out in Oxfordshire, and one of the first in Great Britain, was a Stage 4 (pre-opening) audit of a new inner relief road by-passing the centre of the historic market town of Banbury The audit report highlighted a number of concerns, including

- poor placement of a primary traffic signal pedestal, causing the signal head to be obscured by tree foliage,
- an absence of barrier lines where needed,
- rigid lamp columns on the outside of safety barriers, and
- a poorly positioned new roundabout, leading to excessive deflection on one approach, and insufficient on another

What did the road safety audit achieve?
It was relatively inexpensive to rectify the first two items, whilst the third one was subject to much greater cost concerns The fourth item was strictly an item which should have been detected at a Stage 2 audit, and any remedial action to this problem had to be foregone because of the cost If this site had been subject to audits at earlier stages (it wasn't because safety audit was introduced in Oxfordshire only in the last weeks prior to opening this road) all of these issues could have been detected, changes made in the design, and little, if any, cost difference incurred It is less costly to change some lines on a drawing than to reconstruct a hazardous site

As road safety audit aims "to get it right first time", resource savings later on in a new road scheme can be expected to more than offset any additional costs in the design process

Site 2 - Calder Freeway/Bulla-Diggers Rest Road, outer north western suburbs of Melbourne.

The Calder Freeway is being created in stages and the above intersection was converted from a conventional two lane, two way cross road to a "wide-median" treatment at the time the freeway was constructed through the intersection This type of intersection treatment is normally restricted to sites on divided rural roads with very wide medians and with very low side road traffic volumes (below about two hundred per day) The Bulla-Diggers Rest Road had more than 1000 vehicles per day when the intersection was built, and the median was only moderately wide

Reported casualty accidents increased immediately after opening The site had not been road safety audited, but was investigated as an accident blackspot whilst less than six months old and there was particular concern about the accident severity at this site It was suggested that some drivers the Bulla-Diggers-Rest Road (east and west) were apparently treating the intersection as a roundabout, leading to serious accidents on the second carriageway as they wrongly anticipated having right of way over the fast moving main road

What could a road safety audit have done?
An early stage (Stage 1 or Stage 2) audit of this new scheme would have drawn attention to the inappropriate use of a 'wide median' treatment for the volumes involved and the median width available, and would have recommended an alternative form of intersection control (possibly grade separation) A Detailed Design stage audit (Stage 3) audit may have recommended substantial changes and additions to the signing and linemarking in an effort to clarify the intersection layout A Pre-opening stage audit (Stage 4) would have further reinforced these delineation recommendations An overpass taking the Bulla-Diggers Rest traffic over the freeway has recently been completed

Site 3 - a pre-opening (Stage 4) audit of a new section of the East Tamar Highway, Launceston, Tasmania.

A new 5 3 kilometre length of highway, with one section built to freeway standard, was to re-join the existing highway at a narrow (two lane, two way) bridge across a small creek Many road schemes tend to use natural boundaries such as creeks as a limit to the extent of the works - a

practice which has lead to some safety concerns over the years In this case the existing bridge would be at the end of a long straight downhill approach, with lane drops from three lanes to two and then down to one lane whilst the road was transitioning from divided to undivided Local concerns were expressed for safety at this bridge, and in response to those concerns a stage 3/4 road safety audit was carried out

What did the road safety audit achieve?

The audit was the first carried out in Tasmania, and was carried out too late to affect the design, but it did recommend increased delineation of the downhill approach to the bridge, improved signing of the lane drops and of the bridge, and increased taper lengths It also recommended early duplication or widening of the bridge It is understood that the new highway has operated safely since opening, and that the bridge has been programmed for eventual improvement

Site 4 - Humber Crescent/Thames Street/ Northway, Durban, South Africa

This was a relatively small traffic management project The opening of a shopping development nearby had exacerbated turning manoeuvres on the arterial road (Northway) at the intersection with Thames Place/Humber Crescent Several accidents had taken place in recent times and a proposal which involved the extension of a central median by about 40 metres was developed to overcome the traffic management and safety problems As a pilot audit for the KwaZulu Department of Transport, this project was audited as it was being built The pilot audit noted the following safety concerns

- design change - contrary to the drawing, an opening in the proposed kerbline had been introduced to allow vehicle access into an adjacent service station (During the site visit, a number of vehicles were observed to be carrying out dangerous turning manoeuvres at this location)
- Inadequate left turn lane - to short and too narrow to adequately and safely provide for the turning traffic
- Several unforgiving roadside objects left in place rather than being removed or relocated
- Crash barrier left in position which was neither necessary nor of suitable standard
- Confusing and inadequate signing of the roadworks from the exit of Thames street particularly so for the hours of darkness

What did the road safety audit achieve?

The audit of this small traffic management project provided a good example to the pilot audit team of the reality of a Stage3/4 audit, and some of the real world issues which can effect any design as it is transformed into works on the ground

7. CONCLUSION

By focussing on the safety aspects of highway designs such as in these examples, the road safety audit process emphasises the need for a conscious decision to be made by a project manager on matters affecting safety Road safety audit will not necessarily make every new design totally

"safe" but it will raise safety high on the decision making agenda and it will cause deliberate decisions to be made on the basis of carefully considered safety advice Road safety audit is changing the way that engineers are designing their new roads

In Britain, road safety audit has become a well accepted step in the design process of most highway authorities In late 1990 the Institution of Highways and Transportation issued a comprehensive document on road safety audit (IHT 1990) which provided a focal point for the introduction of this new process in Britain The British Department of Transport (DTp 1990) directed that all new schemes on motorways and trunk roads be audited by an independent auditor after 1 April 1991 This has since evolved to the stage where British highway authorities have road safety audit procedures for road schemes on their own roads as well as DTp roads

There is no such federal requirement in Australia, but State Road Authorities have followed their British colleagues, and at present are well advanced with the road safety audit process A similar situation exists in New Zealand, where TRANSIT New Zealand introduced safety audit with a widespread series of pilot audits and training courses and continues to promote the process to local government

Safety audit seeks to take an overall view of safety in a scheme and to highlight any changes necessary to optimise safety Safety audit aims to reduce the whole life cost of a scheme and raises the question of accident costs as a part of the whole life costs of a road scheme Experience with road safety audit suggests that safety is now an explicit factor in all levels of decision making about new designs, rather than an implicit consideration as previously
Whether or not road safety audit lives up to its promise depends on the commitment and endeavours of the management and staff of each state road authority and each highway authority I believe, with much optimism, that the safety mistakes of the past can be minimised on future new roads and that road safety audit will take its place alongside accident reduction work as an important and essential process in road safety engineering

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THE SAFETY AUDIT TEAM

Road Safety Audit Seminar

ITE Annual Meeting

Las Vegas, Nevada, August 5, 1999

by

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Figure References: Introducing Road Safety Audits and Design Safety Reviews, Section 3.2 p. 31

OUTLINE

1. Team Qualifications
2. Team Size
3. Experience Mix
4. Perspectives
5. Composition / Source
6. Certification

TEAM QUALIFICATIONS

1. Independence
2. Adequate Size and Resources
3. Recognized Expertise
4. Varied Experience
5. Objectivity & Open Mind
6. Dedication (Time)
7. No Hidden Agenda
8. Back-Up Resources

TEAM SIZE

- Function of Size of Project
- Move Away from One Person Teams
- Small Project (<$1 Million): 2 or 3 Persons

  Medium Project (<$50 Million): 3 or 4 Persons

  Large Project (>$50 Million): 4 to 6 Persons
- Examples: Highway 407, Ontario
  Highway 1, British Columbia

EXPERIENCE MIX

- Road Safety Expert
- Design Engineer
- Police Officer
- Specialists
- Maintenance / Operations Engineer or Technician
- Back-Up Support
- Selection Appropriate for Project

ROAD SAFETY EXPERT

- Design Elements / Safety Relationships
- Safety Engineering Principles & Practice
  - Collision Mitigation
  - Road Design and Improvement
  - Relationship of Capacity & Operations with Safety
  - Safety Management / Risk Assessment / Marginal Thinking
- Multi-Modal Perspective
- Previous Audit Experience
- Access to Latest Safety Engineering Research and Literature
- Collision Investigation / Expert Witness Experience
- Team Management Skills

DESIGN ENGINEER

- Road Design Standards - Several Jurisdictions
- Design Practice - Affected Jurisdiction
- Positive Guidance Signing / Marking
- Local Characteristics, Topography
- Visualization

SPECIALISTS

- Human Factors
- Commercial Vehicles
- Transit / Cyclists / Pedestrians
- Traffic Calming
- Street Lighting
- Intelligent Transportation Systems
- Signal Control

POLICE

- Accident Response
- Traffic Management
- Knowledge of Area Roads
- Knowledge of Driver Characteristics

MAINTENANCE / OPERATIONS

- Practical working knowledge on similar roads

BACK - UP SUPPORT

- Resources to Fill- In
- Resources for Back Up Research and Analysis

PERSPECTIVES

- Variety of Perspectives Encouraged on the Team
- Private & Public Sector Experience
- Young & Old
- Male & Female
- Multi-Ethnic

COMPOSITION / SOURCE

- **Less Desirable:**

  Within Road Agency: Seek Separate Department
  or
  Seek Separate Regional Office

- **More Desirable**

  - **Another Road Agency: Professional Colleagues but Avoid "Friends"**

  - **Consultants: Avoid "In-House" Consultant**

- **Mix and Match, but MAINTAIN DISTANCE AND INDEPENDENCE**

CERTIFICATION

- Who is Qualified?
- Training and Certification Being Considered
- Courses (basic & advanced)
- On-Job Training Prior to Certification
- Maintain Skills through Regular Practice
- Pool of Expertise Has to be Expanded (World Wide)

SUMMARY

- Clear Qualifications are Essential
- Size appropriate to the Project
- Relevant Experience Mix
- Broad Perspectives an Asset
- Variety of Source Available
- Need for Certification